



A.D. 1866, 13th August. N^o 2072.

S P E C I F I C A T I O N

OF

DÉSIRÉ MARCHAL.

COMBUSTION OF SMOKE.

LONDON:

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A D. 1866, 13th AUGUST. N° 2072.

Combustion of Smoke.

LETTERS PATENT to Désiré Marchal, of Brussels, in the Kingdom of Belgium, Civil Engineer, for the Invention of “**IMPROVEMENTS IN THE COMBUSTION AND PREVENTION OF SMOKE AND IN INCREASING THE HEATING POWER OF FUEL.**”

Sealed the 8th February 1867, and dated the 13th August 1866.

PROVISIONAL SPECIFICATION left by the said Désiré Marchal at the Office of the Commissioners of Patents, with his Petition, on the 13th August 1866.

I, **DÉSIRÉ MARCHAL**, of Brussels, in the Kingdom of Belgium, Civil Engineer, do hereby declare the nature of the said Invention for “**IMPROVEMENTS IN THE COMBUSTION AND PREVENTION OF SMOKE AND IN INCREASING THE HEATING POWER OF FUEL,**” to be as follows:—

This Invention consists in the employment of certain improved processes which are applicable to every description of furnace, oven, or grate in which
10 fuel is employed for heating purposes, and whereby the smoke and gaseous products evolved during combustion are effectually and economically consumed. These results are obtained by introducing through apertures, constructed in the sides or other convenient parts of the furnace, oven, or grate, currents or jets of heated air or superheated steam, the latter when used

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having been previously carburated as herein-after mentioned. The heated air or superheated and carburated steam is conducted from the reservoir in which the same is contained to the before-mentioned apertures by means of tubes, and issuing through the apertures in the furnace, oven, or grate operates upon the incandescent fuel, to which it imparts great additional heat and mingles 5 with the smoke and gaseous products evolved therefrom, the latter being completely consumed and utilized. The carburization of the heated air and superheated steam may be effected by any of the well-known methods, but one of the most simple modes is to cause the air or steam to pass through or be placed in communication with suitable receivers or vessels containing volatile 10 hydrocarbon fluids or substances such as petroleum oil, bituminous schist, or the oil obtained therefrom, naphtha, tar, or essence of turpentine, or any analogous and suitable substance, such substances, or any or either of them, being employed singly or in combination with each other. The heated air or superheated steam thus brought into contact with the before-mentioned 15 substances, or whichever of them are or is so employed, raises the same rapidly to the like temperature, and causes the same to be converted into gas or vapour, a portion whereof becomes mixed with the heated air or superheated steam, which together with the remainder of the gas evolved enters the furnace, oven, or grate, where the same become instantly inflamed and combine with 20 and consume the smoke and other products resulting from the combustion of the fuel. A jet of hydrogen gas, either alone or used in combination with hot air or superheated steam, carburated as before mentioned, may also be employed with similar results. In some cases in which this Invention may be applied to furnaces, ovens, or grates of peculiar construction some 25 variations of the mechanism and arrangements employed for the introduction of the heated air or superheated steam may be necessary; but inasmuch as they do not affect the principles of this Invention, and will be manifest to any person conversant with such operations, they need not be particularly described.

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SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Désiré Marchal in the Great Seal Patent Office on the 12th February 1867.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, DÉSIRÉ MARCHAL, of Brussels, in the Kingdom of Belgium, Civil Engineer, send 35 greeting.

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WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Thirteenth day of August, in the year of our Lord One thousand eight hundred and sixty-six, in the thirtieth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto
5 me, the said Désiré Marchal, Her special licence that I, the said Désiré Marchal, my executors, administrators, and assigns, or such others as I, the said Désiré Marchal, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make,
10 use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for “IMPROVEMENTS IN THE COMBUSTION AND PREVENTION OF SMOKE AND IN INCREASING THE HEATING POWER OF FUEL,” upon the condition (amongst others) that I, the said Désiré Marchal, my executors or administrators, by an instrument in writing
15 under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

20 NOW KNOW YE, that I, the said Désiré Marchal, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement (that is to say) :—

My said Invention, which is applicable to every description of furnace, oven,
25 or grate, consists of certain improved precesses by the use of which the smoke and gaseous products of combustion are economically consumed. This result is obtained by the introduction into the grate or furnace, by means of tubes or through small lateral openings, of a current of hot air or the vapour of water previously carburetted; such current is previously passed through very fine
30 metallic wire gauze which has the effect of finely dividing the molecules of the said current before it penetrates into the furnace in which they combine with the atmospheric air contained therein and the products of the substances in course of combustion, whereby the steam is decomposed and hydrogen gas evolved, which in conjunction with the hydrocarbon employed as herein-after
35 mentioned becomes instantly a sheet of flame covering the surface of the combustible fuel, and through which flame the smoke and gases seeking to escape towards the chimney must pass and are necessarily consumed. The carburization of the hot air or vapour of water may be effected by any of the ordinary methods, one of the most simple of which is that of placing the

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current of air or jet of steam in communication with a reservoir or receptacle of any convenient and suitable form containing volatile hydrocarbons capable of being converted into gas, such as petroleum oils, bituminous schist, naphtha, tar, or essence of turpentine, or any other analogous substance or substances either singly or in combination. The current of air or steam is turned into 5 the reservoir or receptacle so as rapidly to raise a portion of the hydrocarbon contained therein to the temperature at which it is volatilised, the current of air or steam is thereby saturated with the vapour of the hydrocarbon and is admitted into the furnace or grate as before described, the reservoir or receptacle containing the hydrocarbon may form part of the furnace or grate, 10 or be placed separately, provided that it be kept at the same temperature as the hot air or steam which is to be the vehicle to convey the hydrocarbon to the furnace.

As another method of effecting the combustion of the gases given off by combustible substances, I use a current of hydrogen gas obtained by any of 15 the well-known processes either alone or in combination with hydrocarbons. Experience has demonstrated that hydrogen gas procured by the decomposition of water is preferable to that procured by any other means, it is cheaply obtained, and imparts to the combustible matter with which it combines a great increase of heating power and consumes the smoke and gases emitted 20 therefrom. The use of hydrogen gas is more especially desirable as assisting the combustion of non-bituminous coal and substances used as fuel, such as peat, lignite, and others, to which it imparts a heating power far superior to that which they possess when burned alone. As regards the better descriptions of bituminous coal which emit a great deal of smoke and gas when in com- 25 bustion, hydrogen gas acts as a powerful auxiliary by instantaneously becoming inflamed when admitted into the furnace, and forming on the surface of the combustible matter therein a sheet of flame which consumes, as before mentioned, the smoke and gases, and thereby considerably increases the amount of heat evolved therefrom. 30

In some cases in which it is desired to apply my said Invention to furnaces, ovens, or grates of peculiar construction, some modifications of the mode of procedure may be desirable, and which it is unnecessary for me to describe, inasmuch as they do not affect the principles of my Invention, and will be readily understood by persons acquainted with such operations. 35

Having thus fully declared and ascertained the nature of my said Invention, and the manner in which it is to be performed, I would observe in conclusion that what I consider novel and original, and therefore claim as constituting the Invention secured to me by the said herein-before in part recited Letters

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Patent is, the methods of effecting the combustion and prevention of smoke, and in increasing the heating power of fuel, substantially herein-before set forth and described, or any mere modifications thereof.

5 In witness whereof, I, the said Désiré Marchal, have hereunto set my hand and seal, this Twelfth day of February, in the year of our Lord One thousand eight hundred and sixty-seven.

DÉSIRÉ MARCHAL. (L.S.)

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